

ON THE FEEDING OF SPERM WHALES (*PHYSETER CATODON*)
IN THE BERING SEA

A. A. Berzin*

The problem of the feeding of sperm whales in the Bering Sea—near Kamchatka, at the Commander Islands, and in the Olutorsky Bay—has been discussed in literature by A. G. Tomilin (1936) and B. A. Zenkovich (1937) on the basis of the analysis of stomach contents of sperm whales killed during the thirties by the whaling flotilla named “Aleut.” Those years, the main objects of exploitation were the fin whales (*Balaenoptera physalus*), while the yearly harvest of sperm whales amounted to 57–113 animals (1936).

At present, the flotilla annually harvests up to 1,170 sperm whales (1957), a quantity that constitutes 87% of the total take. Throughout the last 10 years, the areas of exploitation have also been changed. In former years, one of the main areas was the Southern (the Kronotsky Bay, the areas near the Morzhevaya Bay, and at the Kozlov and the Shipunsky Capes), whereas now the main areas, besides the Commander Islands, are the Blizhny Straits, Attu Island, as well as the waters washing the northern side of the Islands (up to 180°).

* Original citation: Berzin, A. A. 1959. [In Russian.] *Izv. Tikhookean. Nauchno-Issled. Inst. Rybn. Khoz. Okeanogr. (TINRO) [Bulletin of the Pacific Ocean Scientific Research Institute of Fisheries and Oceanography]* 47:161-165. Translated by Leda V. Sagen, School of Fisheries, University of Washington, Seattle, 1970. Transferred to electronic format and edited by Mark Uhen and Michell Kwon, Smithsonian Institution, 2007.

The present-day exploitation area of the whaling fleet “Aleut” may be divided into three natural regions: the Commander—the waters washing the islands eastward to the middle of the Blizhny Straits (170° east longitude); the Aleutian—the waters east of 170° east longitude (the Stalemate Spit, the waters north of the Aleutian Islands up to 180°); and the Northern—the Olutorsky Bay along with the adjacent waters of the Koriaksky coastline (as far as the traverse of the Bay Glubokaya).

The change in the exploitation area of the flotilla, and the tenfold increase of the harvest of sperm whales have provided new data on the species composition of food objects found in the stomachs of sperm whales that have extended and perfected our former concepts of the feeding of these whales.

The work at hand is based on the samplings of stomach contents of sperm whales collected by the author on board the factory ship “Aleut” during the exploitation season of 1957.

The contents of 110 stomachs of sperm whales taken from different areas were subjected to a qualitative analysis. A particular attention was paid to the sperm whales killed in the new areas recently adopted, or in those under initial exploitation (such as the Bayer’s Spit north of the western Aleutian Islands).

The study of the quantitative indices of feeding of sperm whales was limited to the determination of the degree of stomach filling by the four-point scale (“empty,” “slight,”

“average,” and “ample”), elaborated for the quantitative characterization of feeding of baleen whales (Suborder Mysticeti). This scale, when studying the feeding of toothed whales (Suborder Odontoceti), may be applied only conditionally.

In our analyses of stomach contents of sperm whales, we often dealt not with the complete food but only with its remains—the rostra and the gladii of squids, the fish bones, etc. Therefore, when opening a stomach and analyzing its contents, we considered the undigested food only. This conditionality is admissible in view of the fact that the rate of digestion of food in the stomach of a sperm whale is unknown to us. We exclude a possibility of the food becoming completely or almost digested during the time following the death of the whale and the start of processing operations because, under the active exploitation regime of the “Aleut” whaling fleet, this period is reduced to a minimum. Having taken all this into account, we considered it possible to apply in our determination of the relative degree of food supply of this or that area the method mentioned earlier.¹

THE CHARACTERISTICS OF STOMACH CONTENTS

Out of 110 stomachs investigated 69, or 64.4% (3 stomachs were empty), contained squids only (Table 1). Usually, when sperm whales feed on squids, their stomachs contain a fluid whose color varies from dark brown, at times almost black, to

¹ The author expresses his gratitude to the Curator of the Museum of TINRO E. A. Kardakova, and to I. I. Akimushkin for their great help in determining the species of fish, crabs, and squids as well as to Laboratory Technician R. Azhimov who participated in the collection of material.

brown and reddish brown, with lumps consisting of gladii, numerous rostra varying in size from small to large (4–4.5 cm), crystalline lenses, and the squids themselves at various degrees of decomposition. Almost all sperm whales were to a various degree infected by the ascarids (*Anisakis*).

Twenty-eight stomachs (26.2%) contained squids and fish, and ten stomachs, or 9.4%, were filled with fish only.

The stomach of one sperm whale, caught in the Commander Islands area, contained 3 crabs (*Lithodes aequispina*) as the secondary objects of feeding. There was no other food in the stomach. This testifies to the fact that sperm whales do not ingest crabs accidentally, but that crabs serve as food when the main food objects are absent.

The stomachs of one sperm whale contained a sponge: obviously a chance incident. B. A. Zenkovich (1937) found in the stomachs of the majority of sperm whales (72%) nothing but the remains of octopi. The stomachs investigated by us did not contain a single octopus. Many event, even if at the present time the octopi do serve as food of sperm whales in the current areas of exploitation by the whaling fleet, the percentage is negligible.

Out of 107 sperm whales, whose stomachs contained food, 67 were harvested in the Commander Islands area, 26—in the Aleutian Islands area, and 14—in the Northern area.

Table 1 makes it evident that 75% of the stomachs of sperm whales from the Commander Islands area were filled only with squids and their remains, and for the Aleutian Islands area their quantity constituted only 54%; 46% of stomachs turned out to be filled with fish and the remains of squids, while 10.5% of stomachs were practically empty. In the Northern area, the quantity of stomachs containing squids diminished almost to 36%.

Thus, the farther east of 170° east long. a sperm whale is taken, the fewer squids are found in his stomach, and a greater importance in his feeding is acquired by fish.

SPECIES COMPOSITION OF SQUIDS

The presence of the three species of squids—*Gonatus magister*, *Gonatus fabricii*, and *Morotheuthis robusta*—in the stomachs of sperm whales from the Bering Sea was pointed out by A. G. Tomilin (1936) and B. A. Zenkovich (1937).

We have identified eight species of the suborder Oegopsida: *Gonatopsis borealis*, *Gonatus magister*, *Gonatus fabricii*, *Morotheuthis robusta*, *Meleagroteuthis separata*, *Galiteuthis armata*, *Onychoteuthis banksii*, and *Chiroteuthis veranyi*.

In the Bering Sea, the food ration of sperm whales evidences the predominance of squids of the family Gonatidae, of *Gonatopsis borealis* (inclusive of specimens up to 130

cm long) in particular, and of *Gonatus magister*, as well as of squids of the family Onychoteuthidae, *Moroteuthis robusta* in particular. The presence of the latter is indicated by a frequent occurrence of cartilage cones of gladii 15–30 cm long that are evidently hard to digest belonging to large squids (up to 2.5–3 m in length). Thus, the stomach of a 14-meter sperm whale, killed in the vicinity of the Commander Islands, contained a squid *M. robusta* whose length (including tentacles) was 280 cm. Next in importance in the feeding of sperm whales is the *Meleagroteuthis separate* squid.

Many authors point out, that in the northern waters the cephalopod molluscs are represented in the feeding of sperm whales by a lesser number of species than they are in the southern waters. E. I. Betesheva and I. I. Akimushkin (1955) were finding in the stomachs of sperm whales from the southern coastal Kuril Islands waters up to 15 and even up to 22 species of cephalopod molluscs simultaneously. In the northern waters, we were encountering simultaneously up to 5 species of squids in a good state of preservation which had been ingested during a short period of time.

SPECIES COMPOSITION OF FISH

Out of 110 stomachs of sperm whales investigated, 38 (or 35.6%) showed only fish, or fish and squids together.

By our identification, the fish turned out to be the representatives of eight families: Agonidae, Scorpaenidae, Plagyodontidae, Rajidae, Petromyzonidae, Cottidae, Cyclopteridae, and Macruridae.

The first place by frequency of occurrence in the stomachs of sperm whales belongs to a soft fish—the *Aptocyclus ventricosus* (Pallas).

One to thirty specimens were found in each of 12 sperm whales, that is, in almost 32% of stomachs that contained fish.

The second place by frequency of occurrence, but the first by the importance in feeding (the degree of filling of a stomach) belongs to ocean perch—genus *Sebastes*. The representatives of this genus were encountered in the quantity from 1 to 25 specimens in the stomachs of six sperm whales. The stomachs of four sperm whales revealed the *Coryphaenoides* sp. (family Macruridae), while those of three sperm whales from the coastal waters of the Aleutian Islands had from 1 to 10 specimens of *Alepisaurus aesculapius* up to 120 cm in length.

Large cartilaginous bones of skates *Raja*, and the eggs of two skate species (up to 25 individuals in a stomach) were found in two sperm whales from the coastal waters of the Olutorsky Peninsula. The fish of genus *Percis* (*Percis japonicus* Pallas (?)) was found in two stomachs, and two stomachs had each a specimen of Pacific lamprey *Entosphenus*

tridentatus Richardson. One stomach contained a representative of Cottidae family—*Myoxocephalus* sp.

THE DEGREE OF STOMACH FILLING OF SPERM WHALES BY AREAS OF EXPLOITATION

The data on the determination of the degree of stomach filling are presented in Table 2.

Table 2 makes it evident that in the Aleutian Islands where, as it is shown earlier, 75% of stomachs of sperm whales had contained squids only, 46.4% of stomachs were well filled, while the rest showed an average or an insignificant filling. In the Aleutian Islands area, a good filling was observed only in 24% of stomachs, while 10.5% were empty. In sperm whales from the Northern area, almost half of the stomachs showed a slight filling.

The farther east of 170° east long., the lesser becomes, in that relation, the importance of squids in the feeding of sperm whales, more importance is gained by fish, and the degree of filling of stomachs shows a decrease.

CONCLUSIONS

1. The food ration of sperm whales in the Bering Sea area is less varied than it is in the Kuril Islands waters, but, nonetheless, their food evidenced nine species of squids, and the representatives of eight families of fish.
2. The food shows the predominance of four squid species: *Gonatopsis borealis*, *Gonatus magister*, *Gonatus fabricii*, and *Moroteuthis robusta*.
3. The following five squid species: *Gonatopsis borealis*, *Meleagroteuthis separata*, *Galiteuthis armata*, *Onychoteuthis banksii*, and *Chiroteuthis veranyi* were not recorded formerly in the stomachs of sperm whales harvested from the areas described.
4. Octopi were not found by us in the food of sperm whales at all; if they are the objects of food of these whales in the Bering Sea, their occurrence is a case of a rare exclusion.
5. Fish are of a lesser importance in the feeding of sperm whales, but in the whales taken near the northern boundaries of their geographic distribution in the Bering Sea, the fish have a predominance over the squids.
6. The number of slightly filled and empty stomachs also increases with the progression eastward and northward from the Commander Islands area.
7. The Commander Islands area is the main feeding area of sperm whales in the Bering Sea, and in the waters of the Pacific Ocean adjacent to it.

REFERENCES

Betesheva, E. I., and Akimushkin, I. I. The feeding of sperm whales in the waters of the Kuril Range area. *Transactions (Trudy) of the Institute of Oceanology of the Academy of Sciences of the USSR*, Vol. XVIII, 1955.

Zenkovich, B. A. The food of the Far Eastern whales, *Reports of the Academy of Sciences of the USSR*, Vol. XVI, No. 4, 1937.

Sleptsov, M. M. The cetaceans of the Far Eastern Seas, *The Bulletin of the Pacific Ocean Scientific Research Institute of Fisheries and Oceanography*, Vol. 38, 1952.

Tomilin, A. G. The sperm whales of the Kamchatka Sea, *The Zoological Journal*, Vol. XV, No. 3, 1936.

Tomilin, A. G. *The Animals of the USSR and of the Adjacent Countries, Vol. IX, Cetaceans*, Academy of Sciences of the USSR, 1957.